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SOLAR OBSERVATIONS

NOTE ON THE DETERMINATION OF THE TRANSMISSION OF COLOR SCREENS EMPLOYED IN SOLAR RADIATION INTENSITY MEASUREMENTS FOR THE COMPUTATION OF ATMOSPHERIC TURBIDTY FROM WHICH THE WATER VAPOR CONTENT OF THE ATMOSPHERE IS DETERMINED.

By H. H. KIMBALL, Research Associate, Harvard University

Ångström, and also Feussner, have called attention to the fact that different samples of the Schott-glass filters OG_1 and RG_2 vary somewhat among samples of the same color. The cut-off curve in the shorter wavelength end of the spectrum is very steep, and the wave lengths between which it occurs vary somewhat with temperature as well as with the individual screens examined. Ångström advises that this cut-off curve should be determined for each screen employed, as this would help to determine the transmission of the screen as a whole.

So far as I am aware, this has not generally been done. After Hoelper wrote me that American atmospheric turbidity determinations did not seem to be in accord with European determinations, an attempt was made to determine the transmission of screens that have been employed at Blue Hill and Washington. In this work, the National Bureau of Standards has been most helpful, especially through the determination of the cut-off curves of samples of yellow and red Schott glass that they believed to be similar in character to screens employed in our regular published measurements.

It was hoped that from these measurements the transmission of our own screens could be determined with the required accuracy. During the month just passed a great deal of time was consumed in trying out different combinations of transmissions in the hope that a combination would be found that would seem to be adapted to Blue Hill screens.

Dr. Brooks computed, from the tests made with the Bureau of Standards' screens, the transmission of the yellow screen to be 0.868, and that of the red screen to be 0.833. When these coefficients were applied to Blue Hill measurements, the results obtained were unsatisfactory.

The results obtained from the transmission coefficients employed by Mr. Hand in reducing measurements obtained at Washington (see this REVIEW for April, 1937, p. 156), also were inadequate when applied to Blue Hill measurements. A great many combinations of transmission coefficients were then tried out, with the result that with a value very close to Dr. Brooks' computed value for the yellow screen, or 0.863, and a transmission coefficient of 0.852 for the red screen, fairly consistent results were obtained.

Commencing with the seventeenth, in the table for May, which accompanies this note, the values of β computed from the differences, $I_m - I_r$, and also from the differences, $I_y - I_r$, are given in the columns headed $\frac{I_y}{.851+c}$ and $\frac{I_r}{.840+c}$. While the results are not all that could be wished, neither set of values is persistently higher than the other, so that it seems fair to assume that some of the irregularities are due in part, at least, to irregularities in the sky conditions during the time the measurements were being made.

This assumption is supported by notes on sky conditions during solar observations. The sky on the twenty-first, twenty-fourth, and thirty-first was unusually free from haze, and the differences between the two sets of β values were not great.

It is hoped that at some time in the not distant future it will be possible to obtain accurate determinations of the cut-off curves of the glass screens OG_1 and OR_2 now in use at Blue Hill, without too much interruption to the observational program.

SOLAR RADIATION OBSERVATIONS DURING MAY 1937

By IRVING F. HAND, Assistant in Solar Radiation Investigations

For a description of instruments employed and their exposures, the reader is referred to the January, 1935 REVIEW, page 24.

Table 1 shows that solar radiation intensities averaged above normal for May at Washington and Madison, and below normal at Lincoln and Blue Hill. Although there was an appreciable amount of dust in the atmosphere at Lincoln, the skies for May at that station showed a decided improvement over those of the preceding month.

Whereas nearly all stations showed a deficiency in the amount of total solar and sky radiation during April, table 2 shows an excess at all stations for May with the exceptions of Riverside and Ithaca.

Table 3 shows an increase in the moisture content of the atmosphere over any preceding month of the year.

Polarization observations made at Washington on 8 days give a mean of 58 percent with a maximum of 64 percent on the eleventh. At Madison, observations made on 6 days give a mean of 56 percent with a maximum of 62 percent on the nineteenth. All of these values are close to the corresponding normals for the month.

TABLE 1.—*Solar radiation intensities during May 1937*

[Gram-calories per minute per square centimeter of normal surface]

Date	Sun's zenith distance										
	8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass									Local mean solar time
		A. M.				*1.0	P. M.				
	e	5.0	4.0	3.0	2.0		2.0	3.0	4.0	5.0	e
	mm	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
WASHINGTON, D. C.											
May 1	5.16		0.88	1.04	1.20	1.44					3.45
May 2	7.29					1.40					6.02
May 3	5.36			1.07	1.23	1.42					3.63
May 4	6.76	0.72	.88	1.03	1.22	1.44	1.13				4.37
May 7	6.02	.54	.70	.90	1.06	1.40					6.27
May 10	8.81					1.46	.64				5.36
May 11	5.56				1.23	1.44	1.09				4.37
May 21	7.29		0.94	1.04	1.20						6.27
Means		(.63)	.85	1.02	1.19	1.43	.95				
Departures		.00	+.13	+.18	+.18	+.15	+.02				
MADISON, WIS.											
May 5	5.56			0.94	1.25	1.56					9.47
May 6	4.75			1.10	1.30	1.49					5.56
May 7	5.79				1.12	1.43					4.95
May 8	7.04				1.18	1.45					6.76
May 10	6.02		0.82	.87	1.14	1.42					6.27
May 12	10.21					1.28					10.59
May 17	5.79		.92		1.30	1.47					6.02
May 19	5.16		.84		1.37	1.54					6.76
May 28	10.59					1.40					11.38
Means			.86	.97	1.24	1.45					
Departures			+.04	+.06	+.13	+.08					
LINCOLN, NEBR.											
May 5	7.87		0.60	0.75							8.18
May 6	7.04	0.50	.55	.61	0.85						5.79
May 7	7.57		.65	.79	1.07						6.76
May 12	7.29	.63	.81	.95	1.14	1.48					6.76
May 15	8.81			.66	.95						10.59
May 17	4.48				1.03						9.47
May 18	10.21			.45	.86		0.96	0.71	0.56	0.43	10.59
May 22	9.14				1.28						6.02
May 26	12.68						1.19	1.03	.89	.78	13.61
May 27	9.83								.88	.67	12.24
May 28	14.10				.98						15.65
May 29	13.13	.65	.78	.95	1.19	1.40					13.61
Means		.59	.68	.74	1.04	(1.44)	(1.08)	(.87)	(.78	.63	
Departures		−.06	−.10	−.18	−.07	+.06	−.02	−.03	−.02	−.04	
BLUE HILL, MASS.											
May 1	4.2	0.54	0.90	1.04	1.21	1.41	1.18	1.05	0.80		5.0
May 2	4.0		.92	1.04	1.17	1.43	1.18	.96	.78		3.8
May 3	4.4		1.00	1.18	1.17	1.33	1.12	.93	.83	0.60	3.6
May 4	6.3					1.28	1.02	.89	.78		3.0
May 9	7.3					1.34	1.12	.78			8.1
May 10	6.3				1.00	1.14	1.03				5.5
May 11	4.2			.96	1.13	1.38	1.10				4.4
May 12	6.1			.92	1.12	1.35					4.8
May 16	5.6				1.12	1.43	1.13				5.1
May 17	5.6					1.31	1.02				5.3
May 18	6.8			.88	1.00	1.16					6.6
May 21	7.1			.96	1.18	1.45					5.8
May 23	10.1					1.05					11.5
May 24	7.9			.96	1.13	1.33					7.5
May 25	7.9				1.11	1.34	1.14				7.7
May 29	11.5					1.20	1.04				10.5
May 30	11.9				1.05	1.32					8.4
May 31	11.5				1.00	1.20	.90	.78			10.4
Means		.54	.94	.99	1.11	1.30	1.08	.90	.80	.60	
Departures		−.27	−.05	−.09	−.02	−.07	+.01	+.01	.00	−.16	

* Extrapolated.